

# Impact mitigation

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## Impact mitigation in environmental impact assessment: paper promises or the basis of consent conditions?

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*This study analysed 40 planning applications in the East of England to investigate the practice of translating paper recommendations in the environmental statement (ES) into legal conditions and obligations. A high proportion (50%) of suggested mitigation measures were not translated into planning conditions or obligations. However, a significant number of additional conditions or obligations, not directly based on the ES, were imposed on developers. The research suggests a mismatch between the practice of those producing ESs and the expectations of planning authorities, leading to inefficiency and, possibly, emasculation of environmental impact assessment through a failure to implement mitigation. Several recommendations are made to increase the effectiveness of the implementation and integration of mitigation measures.*

Keywords: mitigation, conditions, planning obligations, effectiveness of mitigation, environmental impact assessment, England, environmental management plans

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The authors would like to thank Jon Gurr for his helpful comments on drafts of this paper.

ENVIRONMENTAL IMPACT assessment (EIA) is a systematic, cyclical process which examines the environmental consequences of planned developments (Glasson *et al*, 1999). A key component of the process is mitigation of predicted impacts (Wood, 2003). Indeed, mitigation could be considered as the foundation of the whole EIA process, in that it is the requirement to identify mitigation measures that translates the findings from the environmental assessment into recommendations to reduce the environmental impacts (Marshall, 2001; Carroll and Turpin, 2002; Environment Agency, 2002). This paper reports the findings from research into the practice of implementing recommended mitigation measures, using a range of planning applications under the English development control system.

Environmental impact assessment became mandatory in all European Union (EU) member states in 1988 through the implementation of the Environmental Assessment Directive 85/337/EEC (Council of the European Communities, 1985), subsequently amended by Directive 97/11/EC (Council of the European Union, 1997) and 2003/35/EC (European Parliament and the Council of the European Union, 2003). The Directive does not use the term 'mitigation' but requires, where significant adverse effects are identified, that "measures envisaged in order to avoid, reduce and, if possible, remedy significant adverse effects" are proposed. Arguably, therefore, the Directive has the mitigation of project impacts as one of its main aims (Wood, 2003).

## Mitigation

The key role of mitigation was recognised in a research report produced for the UK Department of the Environment, Transport and the Regions (DETR) in 1997 (DETR, 1997), which reviewed current procedures at the time, and recommended that specific guidance on good practice relating to mitigation measures and their enforcement should be produced.

Impacts that require mitigation may be identified throughout the whole EIA process, frequently after the preparation of the environmental statement (ES) (Wood, 2003). Almost by definition, therefore, there is a merging of a range of mitigation types (for example, avoiding or reducing impacts, repairing the environment or compensating for adverse impacts, or possibly even enhancing the environment (Mitchell, 1997), throughout the development control process.

In addition, because mitigation is inherent in all aspects of the EIA system (Glasson *et al*, 1999), it is subject to the same constraints and weaknesses as impact evaluation. For example, mitigation measures proposed often do not give any indication as to their potential effectiveness in ameliorating significant impacts (Byron, 2000). Hence, they are of little use to decision makers.

Similar considerations apply in terms of feasibility of proposed measures: there is a need for at least technical, operational and economic tests to be applied (Marshall, 2001). Again, recommendations that do not comply with these criteria are of questionable use.

Lastly, and most crucially, is the aspect of verification. In many cases, mitigation is viewed as a series of non-binding proposals in an ES (Morrison-Saunders *et al*, 2001). Conditions and recommendations need to be monitored and enforced to ensure implementation and, therefore, effective mitigation (Marshall, 2001; Wood, 2003). It is this area of enforceability throughout the development control process that is the focus of this research.

The detailed description of the implementation of the Environmental Assessment Directive in England is covered adequately elsewhere (see, for example, Bond, 1997; Weston, 1997; Glasson *et al*, 1999). Of relevance to this research is that, in England and Wales, projects subject to planning control are dealt with under the Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999 (SI 293) (DETR, 1999b), while those outside planning control are dealt with by a range of sectoral EIA regulations (for example, pipelines, highways, land drainage schemes and ports) (DETR/National Assembly for Wales, 2000).

The proportion of projects subject to EIA under the planning regulations is not clear from existing literature. For example, Glasson *et al* (1999) report that projects falling under the planning regulations in England and Wales comprise approximately 60% of

all EIAs carried out in the UK. Bellanger and Frost (1997) report that 91% of all ESs completed between July 1988 and January 1997 were submitted under the EIA planning regulations (in either England and Wales, Scotland or Northern Ireland). On the other hand, the Essex Planning Officers' Association (2002) estimate that approximately 80% of projects in England requiring EIA are subject to planning control. In the aggregate, this evidence thus indicates that the ESs submitted under the planning regulations in England comprise a significant proportion of all those submitted in the UK as a whole.

However, the role of EIA in decision making within the English planning system needs to be placed into context. Weston (2002) reports that only 0.1% of all planning applications are subject to EIA. For those that are, the ES submitted with the planning application is considered to be 'material evidence' along with policy guidance, public comments and good practice guidance. All these are secondary to the policies in the local plan in terms of decision making on planning applications (Weston, 1997). Thus, EIA is not afforded great significance in the planning system and it is not surprising that information in the ES, including the mitigation measures, is not legally binding.

## Conditions and obligations

In England, planning permissions are subject to conditions concerning the time limits for carrying out a development, but most also contain specific conditions imposed by local planning authorities (Cullingworth and Nadin, 2002). Case law has demonstrated, however, that planning authorities cannot determine that an EIA is not required at the screening stage on the basis that significant impacts can be addressed by suitable conditions (the key case here is Regina, on the application of Lebus, v South Cambridgeshire District Council in 2003 (Tromans and Fuller, 2003)).

Whilst the power to impose conditions is not limitless, as the conditions have to be appropriate from a planning point of view, they can be used to enhance the quality of a development and mitigate against adverse effects. Such conditions may incorporate mitigation measures proposed in the ES, although planning authorities may also compile lists of model or standard conditions (DOE, 1995). There are two main forms of planning conditions: those that require actions to be taken before development commences, and those that require compliance with specified controls during the life of the development (DOE, 1995).

Failure to comply with planning conditions may result in a breach of condition notice being served by the planning authority (DOE, 1995), suggesting that the inclusion of mitigation measures in planning conditions has the potential to be an effective method to ensure their implementation. If a developer wishes to apply to vary conditions attached to a

planning application, this in itself constitutes a new application for planning application under planning law and an EIA may be required (Hakes, 2005).

When conditions are insufficient to overcome planning objections to a development, planning obligations may be used. Obligations are regulated under Section 106 of the Town and Country Planning Act 1990 and are enforced through contract law in the form of a legal agreement between the developer and the planning authority (Carroll and Turpin, 2002).

Planning obligations may restrict the development of land, require certain activities to be carried out, require land to be used in a specified way, or require payments to be made to the planning authority (DOE, 1997a). They are more appropriate than conditions for the long-term management of land, or for measures affecting land outside the development site (Essex Planning Officers' Association, 2002). Obligations thus offer a broader scope than conditions, and can provide a means of reconciling the interests of a developer with the need to safeguard the local environment (DOE, 1997a).

However, one potential problem with the use of conditions and obligations to ensure mitigation implementation is that, unless the ES is very precise about specific mitigation measures, it is not possible to create a valid condition requiring the development to be "in accordance with the ES" (DETR, 1997, page 52). Any such condition must also refer to a specific section of the ES, rather than the entire document (DETR, 1999a). This means that, in general, the ES can be used as a starting point only for the drafting of conditions and obligations. On the other hand, failure by developers to implement mitigation measures discussed in an ES, which have not been translated into planning conditions, has sometimes led to the inclusion of very detailed conditions in the planning permissions of other, subsequent developments (Singleton *et al*, 1999).

Research has found that it is very rare for planning conditions to cover all the aspects of project design and implementation that could mitigate environmental impacts (DETR, 1997). This is possibly because, to ensure that all the mitigation measures

could be enforced, conditions would need to be specified for each measure, resulting in an unfeasibly large number. As a result, planning authorities often prioritise the measures considered most necessary for delivering an acceptable development (DETR, 1997).

Consultation may also be important in establishing mitigation measures and may lead to the formulation of conditions relating to measures that were not mentioned in the ES (DETR, 1997; Wood and Jones, 1997). In addition, the time lapse between submission of an ES and granting of planning permission may mean that the ES is out of date by the time planning conditions are formulated, significantly reducing its usefulness in determining mitigation (DETR, 1997). Practices may also vary in different regions, as the local planning authorities (LPAs) have a high degree of independence and autonomy (Leu *et al*, 1996).

One possible means of improving the link between predictions made, mitigation measures specified in an ES and their implementation, is the environmental management plan (EMP). EMPs are defined by the World Bank (1999a, p.1) as documents that

"outline the mitigation, monitoring, and institutional measures to be taken during project implementation and operation to avoid or control adverse environmental impacts, and the actions needed to implement these measures."

An EMP thus forms a more systematic and explicit document to be used by planning authorities in formulating conditions (Brew and Lee, 1996), increasing the likelihood that mitigation measures identified and described in the ES will be implemented. Although there is no requirement currently for EMPs to be prepared under the English planning system, they are increasingly advocated by the World Bank (1999b) for use internationally, and have been used in England on a voluntary basis (Hickie and Wade, 1997).

Alternatively, there have been suggestions that environmental management systems (EMS) have a role to play in the implementation of mitigation measures and conditions (Glasson *et al*, 1999; Arts *et al*, 2001; Sánchez and Hacking, 2002). In England, the DETR, in Circular 02/99, referred specifically to this option. They envisaged that developers could adopt an EMS as a possible means of firstly, demonstrating that mitigation measures are in place, and secondly, monitoring whether they are effective (DETR, 1999a).

#### *Translating into practice*

This paper describes research that investigated how mitigation measures are translated into practice through the use of planning conditions and obligations in England, with a view to developing

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recommendations for improving the effectiveness of this process. In doing so, the authors focus on the role of EIA as providing information to improve decision-making, in this case as the basis of setting conditions and planning obligations. However, it is acknowledged that there are alternative theoretical perspectives on the role of EIA in decision-making.

Environmental assessment had its basis in rationalist roots, whereby the presentation of better information would, by definition, lead to better decisions. This view was predicated on the rational behaviour of stakeholders and, in particular, decision makers. More and more authors argue that decision-making is not rational and that EIA has considerably more roles than simply information provision (see, for example, Lawrence, 2000; Leknes, 2001; Bond, 2003; Bekker *et al*, 2004; Cashmore, 2004; Owens *et al*, 2004).

Bartlett and Kurian (1999) detail six separate models explaining the role of EIA in decision-making, in which the information processing (rational) model is just one end of the spectrum of influence; other models include the symbolic politics model, the political economy model, the organisational politics model, the pluralist politics model and the institutionalist model. These alternative theoretical frameworks are not addressed in this research, which is purely empirical, nor is the extensive literature on decision-making theory covered.

The research also aims to determine whether research published by the UK Government on mitigation measures in environmental statements (DETR, 1997) had any effect on this translation into conditions and obligations. The next section is devoted to the description and justification of the methodology adopted for the study. This is followed by a presentation of the results and associated discussion. Finally, the conclusions are presented, along with recommendations for improving the conversion of suggested mitigation measures into contractual conditions and obligations.

## Methodology

### *Selection and collection of data*

The focus of the research was on the relationship between mitigation measures identified in the ES and actual conditions and obligations detailed in the development control decision. Therefore, the selection of the projects to be investigated had to be based on developments that were subject to planning control for which permission had been granted, and an EIA had been carried out.

Reference has already been made to the small proportion of planning applications that require an ES (Weston, 2002). Other evidence suggests that many planning authorities have received few, if any, ESs (Gwilliam, 2002). Therefore, to ensure a viable sample size, an area approach was adopted for collection



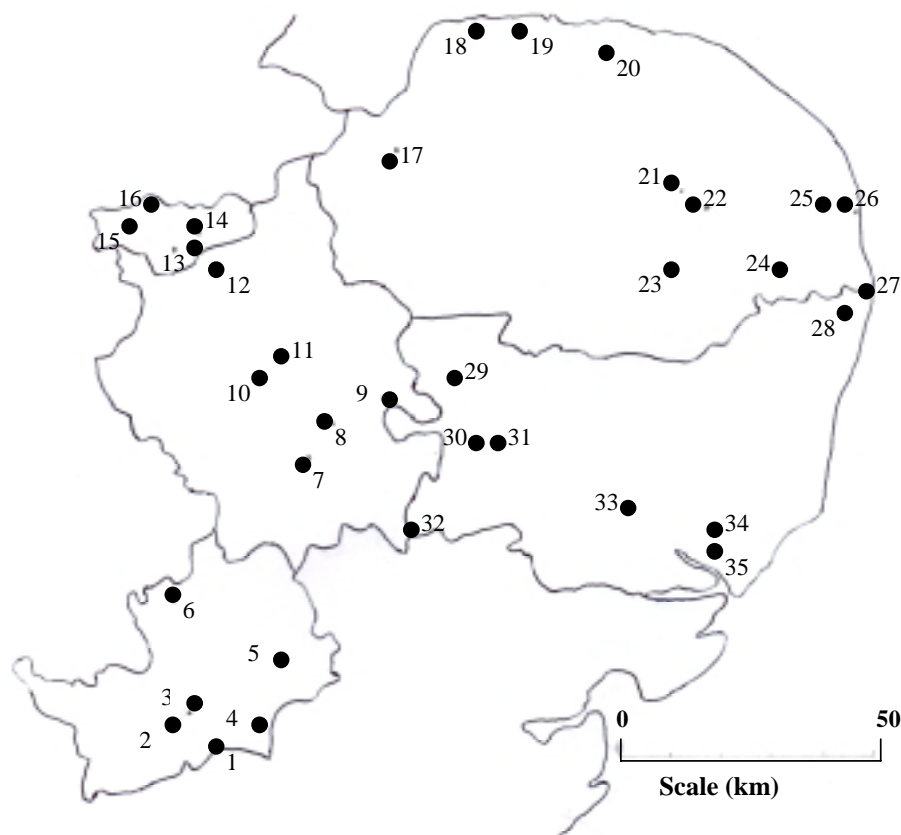
Figure 1. English regions

of the information, and the selection included all developments with an ES from 1988 (when the EIA regulations were first introduced), until mid-2003.

Forty developments were identified in four counties within the East of England planning region (see Figure 1): Norfolk, Suffolk, Cambridgeshire and Hertfordshire. The spatial coverage of the developments is displayed in Figure 2. To ensure a range of development types, cases were included from district, county and unitary authority level. Table 1 sets out the selected developments categorised according to their main use. From this it is evident that two categories (waste management facilities and mineral extraction), accounted for 25 of the 40 applications examined.

Table 1. Categorisation of developments according to main use

Waste management facility (11 developments, 4 in 1988–1997 sample and 7 in 1998–2003)
Mineral extraction (14 developments, 3 in 1988–1997 sample and 11 in 1998–2003)
Residential (1 development)
Agricultural (2 developments)
Golf course (3 developments)
Commercial (1 development)
Industrial (1 development)
Road (2 developments)
Flood defence (1 development)
Mixed-use (4 developments)



**Figure 2. Locations of the developments studied**

*Key:*

1 Barnet	2 Tyttenhangar	3 Hatfield
4 Turnford	5 Colliers End	6 Holwell
7 Cambridge	8 Waterbeach	9 Fordham
10 Needingworth	11 Colne Fen	12 Whittlesey
13 Fletton	14 Eye (2 devs)	15 Southorpe
16 Maxey	17 King's Lynn (3 devs)	18 Brancaster (2 devs)
19 Burnham Overy	20 Holt	21 Costessey
22 Norwich	23 Tharston	24 Norton Subcourse
25 Halvergate Marshes	26 Great Yarmouth	27 Lowestoft
28 Gisleham	29 Lackford	30 Fornham (2 devs)
31 Bury St Edmunds	32 Haverhill	33 Bramford
34 Foxhall	35 Bucklesham	

Data collection was carried out at the planning offices in two stages. Having identified the developments that satisfied the selection criteria, all the mitigation measures proposed in the ESs were recorded. For this research, no attempt was made to evaluate the significance of the measures proposed in terms of their potential consequences for the development, or to analyse the quality of the ES.

A second stage involved studying the planning files for the developments, and recording the planning conditions from the decision notices. If the development had a Section 106 Agreement containing planning obligations, these were also recorded. Only those conditions and obligations relevant to impact mitigation were considered: all others, such as those concerning the timing of the development, were excluded. In addition, the ESs were examined to determine whether an EMP was in place (or whether there was any commitment to prepare one), as part of a strategy to ensure the implementation of mitigation measures set out in the statement.

### *Data analysis*

Thérivel and Morris (2001) present advice on carrying out EIA in compliance with the English EIA regulations and with the EU Environmental Assessment Directive. Their categorisation of environmental components was used in this research as it reflects those commonly discussed in English ESs, although this list differs slightly from those components identified in the regulations. Thus, mitigation measures, planning conditions and obligations were categorised under the following environmental aspects: landscape; air and climate; water; ecology; soil and geology; noise; socio-economic; cultural heritage; and transport.

In addition, the mitigation measures were classified into five types taking into account the 'mitigation hierarchy': avoid; reduce; repair; compensate; and enhance (Mitchell, 1997).

For each of the development cases considered, data were also categorised according to the use of

mitigation measures in development consent decisions:

- mitigation measures covered by conditions;
- mitigation measures covered by obligations;
- mitigation measures not covered by conditions or obligations;
- extra conditions not based on mitigation measures; and,
- extra obligations not based on mitigation measures.

As such, data gathered take the form of a frequency distribution using nominal data. The appropriate statistical technique for testing hypotheses for such data is the goodness of fit chi square test (Burns, 2000), although it is only possible to test associations to determine whether frequency distributions match a distribution predicted by the null hypothesis.

Chi square tests were thus carried out to determine whether environmental aspect has any influence on each of the five categories of the use of mitigation measures in development consent decisions. The null hypothesis was that environmental aspect has no influence on the numbers of mitigation measures, conditions, or obligations. This analysis was repeated for the mitigation hierarchy (Mitchell, 1997), with the null hypothesis that there was no difference between the five types of mitigation measure and each of the five categories of the use of mitigation measures in development consent decisions.

Chi square tests are also suitable for data classified into categories based on two variables to determine whether they are independent or associated (Burns, 2000). Contingency tables are used to test for the independence of row and column variables and, for these data, one contingency table was used to test the categories of use of mitigation measures against environmental aspect, and another to test the categories of use of mitigation measures against mitigation type.

The data for waste management facilities and mineral extractions were divided into applications submitted between 1988 and 1997 and between 1998 and 2003 (as these were the only development categories in the sample where the planning application had been accompanied by an ES before 1998) in order to assess whether the DETR's (1997) study affected planning practice. The ES submission date was used to prevent applications prepared before the study was published, but determined after 1997, being categorised as having occurred after the study. This precaution thus avoided the possibility that those applications that were in the pipeline when the study was published affected the analysis.

## Results and discussion

### *Summary and overview*

The results from the research into 40 separate planning applications accompanied by ESs revealed that

less than half (686 or 42%) of the total mitigation measures identified from the examination of the statements were covered by planning conditions; a further 133 (8%) were covered by obligations, and 831 (50%) were not covered. The relatively high numbers of mitigation measures not covered by conditions in the planning permission, coupled with the large numbers (638) of extra conditions (those not deriving from mitigation measures proposed in the ES), suggest that factors other than the EIA process are extremely important in formulating planning conditions relating to mitigation of environmental impacts.

Whilst the majority of planning obligations imposed (133 or 59%) covered mitigation measures identified in the ESs, a large proportion (92 or 41%) of the obligations required were not mentioned in the statements. This suggests that other factors other than the existence of an ES play a key role in formulating obligations under the English development control system.

These findings (that many mitigation measures are not converted into planning conditions, plus a large number of non-identified conditions and obligations are imposed) are in agreement with the DETR's (1997) study. A possible reason for this could be that changes in project design between ES submission and the granting of permission may result in many mitigation measures being irrelevant (DETR, 1997; Frost, 1997). In addition, a degree of prioritisation will have to be exercised by the planning authority: the sheer number of conditions necessary to cover all the measures identified in an ES may make decision making too complex (DETR, 1997; 1999a).

Nevertheless, legitimate concern arises because half the mitigation measures recommended in the ESs are not addressed in the planning decision, meaning that their implementation would be discretionary. There could be a lack of commitment to put these measures in place, despite their being listed in the ES (Morrison-Saunders *et al*, 2001).

Turning to the large proportion of extra planning conditions and obligations imposed, there are potentially several factors influencing this situation. Decisions on the trade-offs between permitting development and mitigation of expected impacts may occur at many stages in the planning process

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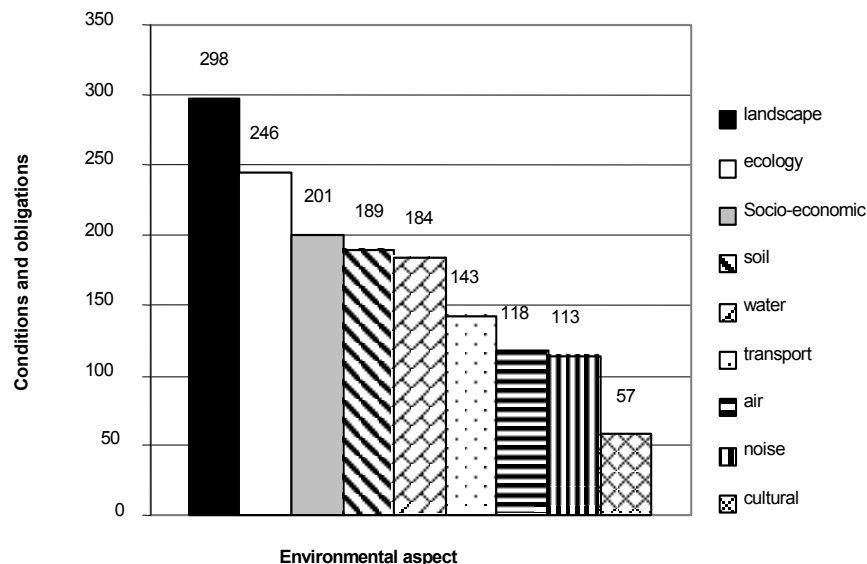


Figure 3. Numbers of conditions and obligations imposed on planning permissions, categorised by environmental aspect

(Glasson *et al.*, 1999). Also, consultations with statutory consultees and other interested parties can lead to extra conditions being formulated (DETR, 1997; Wood and Jones, 1997).

More specifically, obligations beyond those detailed in an ES can result from negotiations between interested parties (DOE, 1997a). As previously discussed, planning authorities may develop their own standard conditions, particularly if they have had relatively more experience of examining ESs, possibly leading to more conditions being imposed (DETR, 1997). There may even be some cynical developers attempting to create an impression of making compromises with planning authorities, by withholding mitigation measures until after the planning application is submitted (Singleton *et al.*, 1999).

The discussion of results above has concentrated on the possible causes of the discrepancies between

mitigation measures in ESs, and planning conditions and obligations imposed by LPAs, across all the developments sampled. Arguably, at a summary level, all these influences could be operating to affect the coverage. The data were then analysed to examine whether environmental aspects, development types, or types of mitigation exercised a significant influence.

#### Environmental aspects

Figure 3 shows a clear difference in the proportion of conditions and obligations imposed on planning permissions among the environmental aspects, suggesting variable treatment by planners. The null hypothesis for the chi square test was that environmental aspect had no significant effect on the use of mitigation measures in development consent decisions. Table 2 (which also includes the mitigation

Table 2. Results of the  $\chi^2$  test testing for randomness of use of mitigation measures against environmental aspects

	Landscape	Air	Water	Ecology	Soil	Noise	Socio-economic	Cultural	Transport	$\chi^2$	Degrees of freedom	Significance level
Conditions based on ES	132	89	81	130	55	43	78	38	40	138.0	8	0.001
Obligations based on ES	7	4	25	46	1	9	25	5	11	114.6	8	0.001
Not covered	55	79	149	169	56	79	156	23	65	235.7	8	0.001
Extra conditions	149	25	71	42	131	61	83	9	67	236.2	8	0.001
Extra obligations	10	0	7	28	2	0	15	5	25			

Note: The analysis shows that the variation in the numbers of conditions based on the ES, on the numbers of obligations based on the ES, on the numbers of mitigation measures in the ES not covered by obligations or conditions, and on the extra numbers of conditions across environmental aspect is not down to chance. That is, they are not equally distributed across the environmental aspects. There are too few data in some categories of environmental aspect for extra obligations not covered by mitigation measures in the ES, hence no  $\chi^2$  value has been calculated.

measures not covered) indicates that the null hypothesis is rejected for four of the 'use of mitigation measures' categories at a confidence level of 99.9%. This demonstrates that environmental aspect does have a significant effect on the use of mitigation measures in development consent decisions. The one remaining category, of additional obligations imposed (not based on mitigation measures in the ES), could not be analysed because of insufficient data.

A further chi square test using a contingency table was carried out to determine if there was an association between the category of environmental aspect and the use of mitigation measures. Data based on additional obligations or conditions were omitted because of low data numbers in some environmental aspect categories (Burns, 2000). As a result, the test was limited to mitigation measures translated into conditions, obligations or not covered at all. The null hypothesis was that there was no association, but, on the basis of the analysis, this was rejected. It is clear, therefore, that the environmental aspect and 'use of mitigation measures' (for those categories tested) are not independent variables.

An attempt was made to classify mitigation measures against environmental aspect to determine whether some common patterns could be detected. Clearly the data reflect two separate groups: the mitigation measures proposed reflect expertise and decisions on behalf of consultants and developers; the obligations and conditions imposed reflect expertise on behalf of planners. Figure 4 plots the additional number of conditions and obligations imposed (representing the views of planners and not those of developers/consultants) against mitigation measures that were not translated into conditions or obligations (representing the views of developers/consultants and not those of planners). The analysis was undertaken to identify the variation in the treatment of the separate environmental aspects.

An additional analysis was carried out (Figure 5) that plots the total number of conditions and obligations imposed against all the mitigation measures suggested, whether or not these were translated into conditions or obligations. Thus, it compares the overall views of planners against those of developers/consultants for each environmental aspect.

When the results for individual environmental aspects are examined, these variations and similarities in treatment become more evident. For example, Figure 5 indicates that planners and developers/consultants agree over the importance of mitigating landscape impacts. Hence, landscape mitigation measures detailed in the ESs influence the conditions imposed in the planning permissions, but other factors must also have been used in setting the extra conditions (Figure 4). The inherent subjectivity in the evaluation of landscape impacts could be a contributory issue, since the quality and character of landscapes, and the significance of impacts on those landscapes, remains essentially a matter of judgement (Hankinson, 1999).

Analysing a different environmental component (in this case, soils and geology) shows that the number of extra conditions and obligations, at 133 (see Figure 4 and Table 2), far exceeds the numbers of covered and uncovered mitigation measures (Figure 5 and Table 2). This suggests that mitigation for this aspect may be poorly addressed by the ESs and that the planning authorities have to rely on other factors when formulating conditions.

There is extensive guidance available for both planners and developers on geological impacts (Hodson *et al*, 2001), and soil protection and restoration in *Planning Policy Guidance Note 7 (PPG7)* (DOE, 1997b) and *Minerals Planning Guidance Note 7 (MPG7)* (DOE, 1996). The results suggest that this guidance, which is primarily directed at planners, is indeed mainly used by them, and that

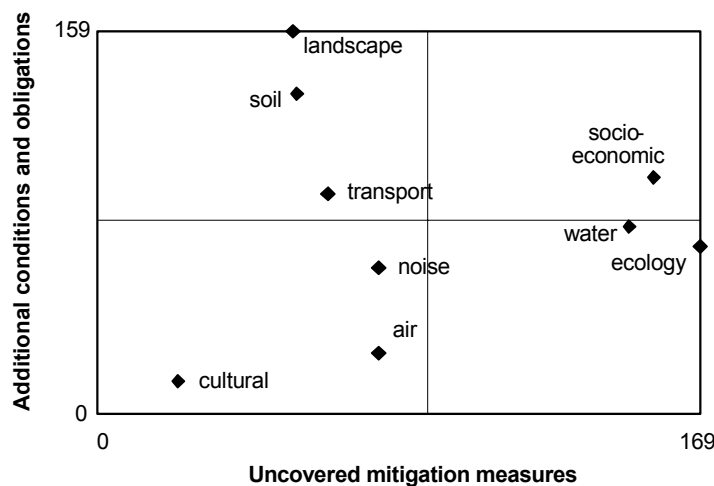
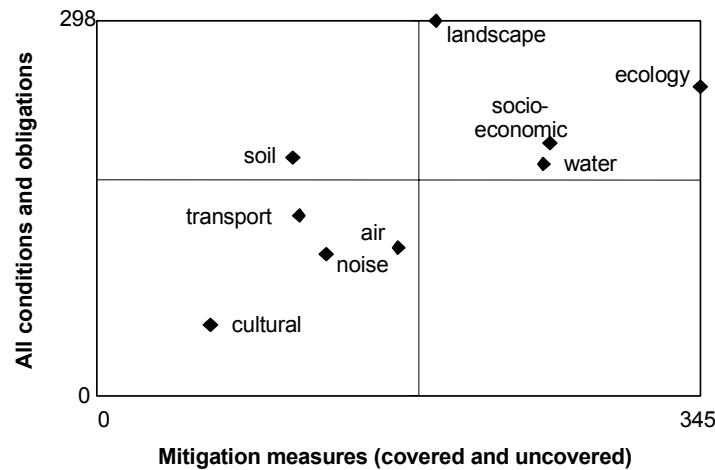


Figure 4. Numbers of additional conditions and obligations (not based on mitigation measures in the ES) imposed on planning decisions compared against the numbers of mitigation measures written into an ES but not imposed through conditions and obligations

Note: The internal axes are drawn at the average value for each data set





**Figure 5. Total numbers of conditions and obligations imposed on planning decisions compared against the total numbers of mitigation measures written into an ES**

*Note:* The internal axes are drawn at the average value for each data set

developers/consultants tend not to rely so heavily on these sources to direct their treatment of these issues.

Most EIAs do not address noise vibration effectively (Thérivel and Breslin, 2001), and the evidence from this study demonstrates that large numbers of additional conditions and obligations are not imposed by planners for the potential noise impacts. The suggestion here is that better guidance might be needed for all groups involved in order to deal more satisfactorily with noise impacts in EIA and in decision making.

Previous research has identified socio-economic impacts as the “the poor relations in British environmental impact statements” (Glasson and Heaney, 1993; Chadwick, 2002). Research has further claimed that there is confusion amongst EIA practitioners over the need and scope for their inclusion, plus there is no clear Government guidance on the treatment of these issues (Chadwick, 2002).

This research, however, indicates that socio-economic impacts are very well represented in terms of suggested mitigation measures, and also by the numbers of additional conditions and obligations imposed, reflecting an understanding of their importance (see Figure 5). At the same time, it is clear from Figure 4 that there is significant disagreement between planners and developers/consultants, perhaps both reflecting the subjectivity of the issue and confirming the lack of clear Government guidance.

The relatively low numbers of air and climate mitigation measures proposed, and the comparatively low number of conditions and obligations (and the even lower numbers of additional conditions and obligations) suggest that this component is not addressed by the planning system alone. Other legislation, such as various pollution control regulations that are applied outside the planning system, could explain this apparently light touch in terms of conditions imposed (Elsom, 2001). Indeed, Government guidance specifically states that the planning system should not formulate controls that will duplicate those required by other statutory bodies (DOE, 1995).

On the other hand, Morris *et al* (2001) indicate that water is well regulated, but the high numbers of mitigation measures and conditions and obligations imposed for this aspect tend to contradict the explanation for the low numbers for air and climate. Both are subject to extensive mandatory legislation and regulation. Further research will be necessary to explain the figures obtained. Figure 4 suggests that planners ignore a relatively high proportion of the mitigation measures proposed as well as imposing conditions and obligations of their own. Again, this reflects a degree of apparent disagreement between planners and developers/consultants that warrants further investigation.

Figure 4 and Figure 5 suggest agreement between planners and developers/consultants over the need to mitigate ecological impacts. Figure 4 indicates that developers/consultants emphasise these impacts slightly more than planners. It is notoriously difficult to predict the impacts of ecological changes arising from individual developments, because of data limitations, lack of understanding of complex ecosystem processes, and the problems of isolating the impacts related to a specific development from cumulative or ongoing changes (Treweek, 1996; Atkinson *et al*, 2000; Byron *et al*, 2000; Morris and Emberton, 2001). Consequently, if the mitigation measures set out in the ES are based on no more than vague predictions, it is not practical for the planning authority to set out specific conditions to achieve them.

The relatively small numbers of suggested mitigation measures and of imposed conditions and obligations for impacts on cultural heritage may indicate there is a need for a much more comprehensive approach to the assessment of these impacts in the development control process (Teller and Bond, 2002). There was some disagreement between the planners and developers/consultants over this environmental aspect, which, studies have indicated, focuses almost exclusively on tangible elements (such as designated

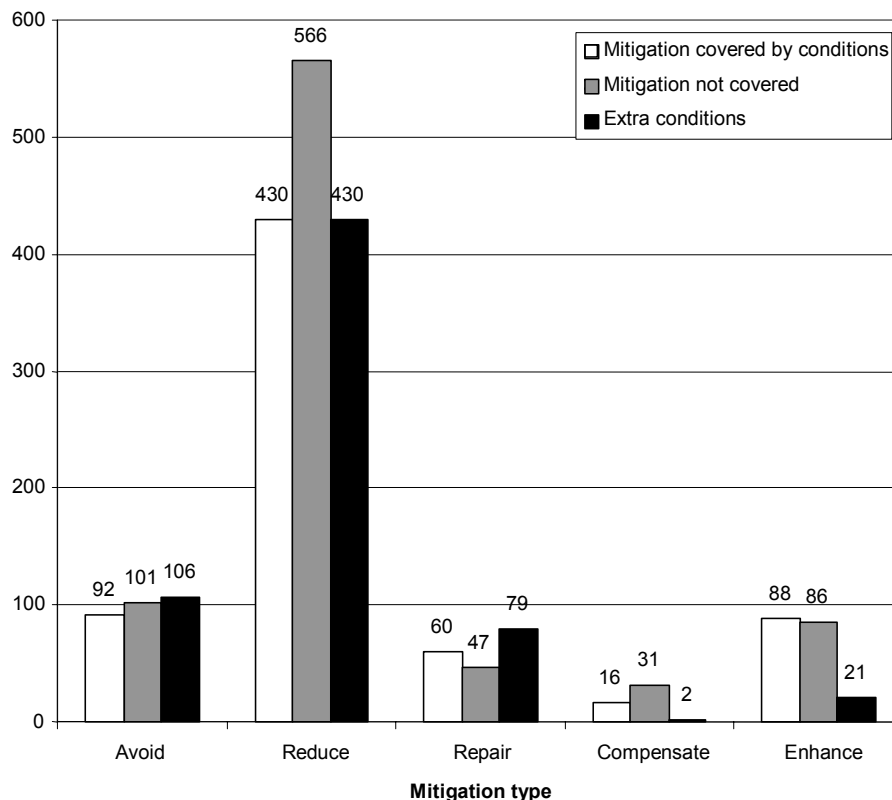


Figure 6. Coverage of mitigation measures by conditions, and the number of extra conditions, for different mitigation types

sites), as opposed to the more intangible aspects (such as cultural identity) (Bond *et al*, 2004). We suggest there is a need for more guidance on the effective consideration of cultural heritage in the EIA process.

### Mitigation types

Mitchell’s (1997) mitigation hierarchy advocates greater use of mitigation measures to avoid and reduce impacts, and, if this were followed in practice, the results would show preferential coverage of these mitigation types for both conditions and obligations.

The differences of coverage among different mitigation types (Figure 6 indicates the patterns for

mitigation measures covered by conditions, those not covered, and the number of extra conditions; the pattern for mitigation measures covered by obligations and numbers of extra obligations is the same) were found to be statistically significant (Table 3). In addition, a contingency table analysis for an association between mitigation type and use of mitigation measures resulted in a rejection of the null hypothesis (that there is no association): the mitigation type and use of mitigation measures (for those categories tested) are not independent variables.

The greatest number of planning conditions in the ESs (and in terms of extra conditions imposed) was for measures to reduce impacts, followed by those to avoid, repair, enhance and compensate (Figure 6). The number of conditions for impact reduction was

Table 3. Results of the X<sup>2</sup> test testing for randomness of use of mitigation measures against mitigation level

	Avoid	Reduce	Repair	Compensate	Enhance	X <sup>2</sup>	Degrees of freedom	Significance level
Conditions based on ES	92	430	60	16	88	807.9	4	0.001
Obligations based on ES	24	63	8	7	31	78.2	4	0.001
Not covered	101	566	47	31	86	1221.5	4	0.001
Extra conditions	106	430	79	2	21	951.5	4	0.001
Extra obligations	17	46	7	6	16	57.2	4	0.001

Note: The analysis shows that the variation in the numbers of conditions based on the ES, on the numbers of obligations based on the ES, on the numbers of mitigation measures in the ES not covered by obligations or conditions, and on the extra numbers of both conditions and obligations across mitigation types is not down to chance. That is, they are not equally distributed across the mitigation types.

**The number of conditions for impact reduction was more than four times greater than the next highest mitigation type, clearly indicating that impact reduction is the preferred mitigation option for both developers and planning authorities**

more than four times greater than the next highest mitigation type, clearly indicating that impact reduction is the preferred mitigation option for both developers and planning authorities.

Relatively low numbers under the 'avoid' category could indicate that the relevant measures have already been implemented before the ES has been presented, particularly those that do not affect the development significantly (Glasson *et al*, 1999). On the other hand, it may be more cost-effective and less controversial to reduce impacts than avoid them altogether (Marshall, 2001). The pattern of extra planning obligations is similar to that for conditions, with only slight differences evident.

#### Change over time

Because of the limited availability of planning applications accompanied by an ES, only two categories of development were included in this analysis: waste management facilities and mineral extractions. Figure 7 has normalised the data in Table 4 into the numbers per ES to allow for different sample sizes in the two time periods under study (see Table 1). The figure suggests that there was no change in the average number of measures covered by either conditions or obligations between applications from 1988–1997 and 1998–2003.

There was, however, nearly a doubling of the number of mitigation measures suggested in the ES and not subsequently covered by conditions or obli-

**Table 1. Use of mitigation measures before and after publication of report on mitigation measures in ESs**

	1988–1997	1998–2003
Conditions based on ES	122	307
Obligations based on ES	12	39
Not covered	77	371
Extra conditions	174	320
Extra obligations	17	41

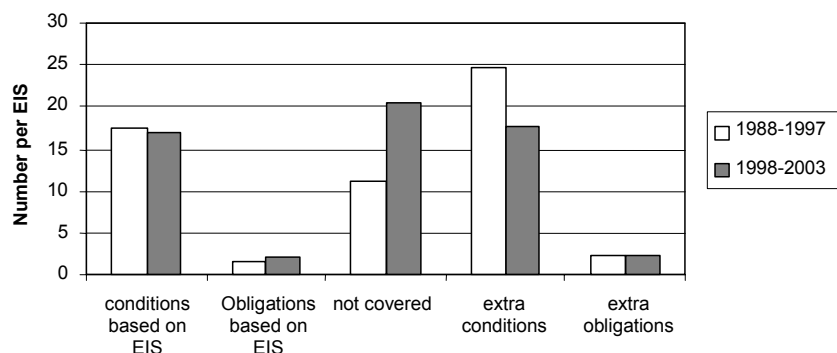
Source: DETR (1997)

gations. A chi square test using a contingency table was carried out to determine if there was an association between the two time periods and the use of mitigation measures (based on the original data prior to normalisation). The null hypothesis, that there is no association, was rejected and it can be stated that the two time periods and the use of mitigation measures are not independent variables.

However, it is not reasonable to postulate that this result flows from the DETR study (DETR, 1997) alone, as the sample size was small and many other reasons could also explain the association. For example, studies have suggested a general improvement in the quality of ESs (Byron *et al*, 2000; Cashmore *et al*, 2002), plus there is, despite the problems discussed earlier, increasing availability of guidance for good practice preparation of ESs (Tromans and Fuller, 2003). In addition, EIA legislation in England changed in 1999, during the second time period (see Table 5), and a contingency table examining the use of mitigation measures before and after the legislation was introduced indicated that the two time periods (before and after new legislation was adopted in 1999) and the use of mitigation measures are not independent variables either.

#### Where next for mitigation in EIA?

Results from this study, therefore, indicate that there is room for improvement both in terms of translating



**Figure 7. Use of mitigation measures before and after publication of report on mitigation measures in ESs (Department of the Environment Transport and the Regions, 1997), normalised per ES**

**Table 5. Use of mitigation measures before and after adoption of new EIA legislation**

	1988–1999	2000–2003
Conditions based on ES	312	117
Obligations based on ES	46	5
Not covered	288	160
Extra conditions	346	148
Extra obligations	39	19

Source: DETR (1999)

mitigation measures identified in ESs into conditions and obligations, and also in terms of increasing the relevance to decision makers of these issues in the presented ES. In addition, it is not evident from the research that the availability of the research document (DETR, 1997) has led to a significant increase in planning authorities' use of mitigation measures covered in the ES.

One solution to the problem of how to improve the effectiveness of EIA and planning in implementing mitigation could be the use of EMPs. As discussed previously, these plans have been promoted by the World Bank (1999b), but Figure 8 suggests that, in this research, there has been a very low voluntary uptake of EMPs in England, at least in the sectors covered. This indicates that developers may be reluctant to expend extra time and resources on the preparation of another document that is not legally required.

However, several developments in the study did use EMPs, or were committed to at least a partial plan. In addition, the Environment Agency has set an example and now recognises the use of environmental action plans (EAPs — similar to EMPs), as a key component of good environmental practice (Hickie and Wade, 1997). Their experience shows that EAPs can be prepared relatively quickly with minimal extra cost if a standard format is used (Hickie and Wade, 1997).

To increase their effectiveness, EMPs would form

the last section of ESs, and detail implementation arrangements and commitments for the mitigation proposed earlier in the ES. To comply with best practice, they would also include monitoring and liaison arrangements, the objectives of the mitigation, and checklists to ensure that mitigation is effectively implemented (Hickie and Wade, 1997).

EMPs under this model would, therefore, play a key role in the implementation of mitigation measures, because they provide a link between the project planning phase, identification of impacts, and mitigation in ESs, and the construction and operational phases (World Bank, 1999b). Unlike ESs, EMPs can continue to evolve throughout the project authorisation stage (Tomlinson, 1997), allowing the addition of any extra mitigation measures required by consultees and the planning authorities.

However, it is clear from the research and other studies (for instance, Brew and Lee, 1996) that the current situation in terms of the interrelationship between EIA and planning authorisations, will not lead to a significant increase in the voluntary uptake of EMPs. As a minimum requirement, guidance would be necessary, as recommended in the 1997 research report published by the DETR, for both developers and planning authorities, to ensure that EMPs are properly enforced by planning conditions and obligations. Even given this advance, there would still be significant changes necessary to the planning and EIA systems to ensure EMPs would be an effective tool in addressing the apparent shortfalls in implementation of mitigation measures.

A possible alternative to EMPs is the use of a schedule of mitigation commitments. This clarifies the mitigation measures a developer is committed to implementing and can be progressively updated as the project evolves (Carroll and Turpin, 2002). The schedules should include details of implementation and enforcement for the mitigation, although they require less detail than an EMP and may thus be more popular with developers. The aim of such mitigation schedules is to establish clearly the

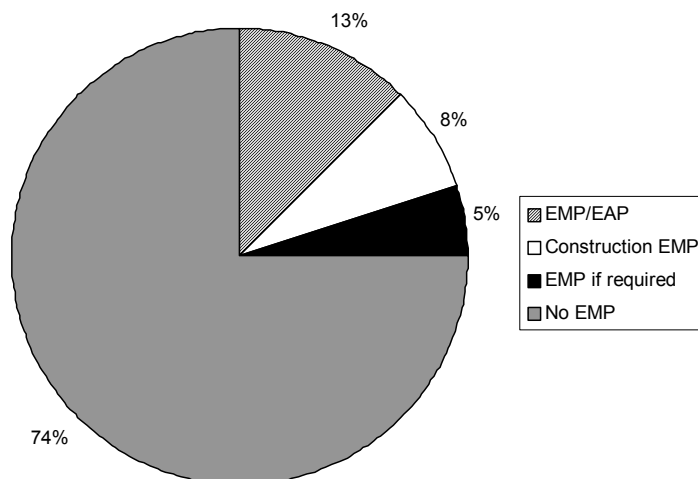


Figure 8. Percentage of developments with an EMP

commitment of a developer to mitigation in a form that can easily be used as the basis for formulating planning conditions and obligations (DETR, 1997). Alternatively, planning conditions can require schemes of mitigation to be submitted before development begins (DETR, 1999a). This allows the planning authority to ensure that an approved programme of mitigation is prepared and implemented.

This alternative could be compared with the situation in California (USA), where state and local agencies have a mechanism, under the California Environmental Quality Act, to ensure that mitigation measures are implemented in accordance with planning permissions. There is a system of reporting for conditions imposed as mitigation measures, with sanctions for non-compliance, plus a regulatory structure for monitoring (Glasson *et al.*, 1999).

Arguably, the Californian system for EIA is comparable with that in England, since both are, in the main, locally administered and linked very closely to the planning system (Wood, 1999), so there could be the potential for transposing a similar mechanism into the UK system. However, it has also been contended that, not unlike the situation in England, because there is no link back to the ES, compliance under the California system has not always been satisfactory (Wood, 2003). Again, despite a potentially more stringent approach in terms of conditions and obligations imposed in the development control decision, this example from the USA still fails to integrate them effectively with the measures set out in the ES.

One possible means of ensuring this integration of mitigation measures in the ES and the conditions and obligations could be the closer linking of the EIA process to EMS. The DETR (1999a) suggested that this was one route that developers could take to demonstrate that they were implementing and monitoring mitigation measures. On a practical level, there is some overlap, since both tools set out to identify significant impacts, and devise measures and action plans to mitigate them (Sánchez and Hacking, 2002). However, EIA is essentially a process, and does not have the framework to manage impacts during construction and operation effectively (Ridgway, 1999).

An EMS approach, on the other hand, specifically puts into place systems to manage and mitigate measures identified, while also evaluating their effectiveness (Arts *et al.*, 2001). This is achieved by translating the measures into enforceable commitments, by a system of objectives and targets, with specific duties and responsibilities for implementation and monitoring (Arts and Nootboom, 1999; Glasson *et al.*, 1999; Sánchez and Hacking, 2002).

Undoubtedly this integration would mean some changes in approach for the EIA process and the completion of the ES. Instead of being stated in very vague terms, and scattered throughout a very large document, the mitigation measures proposed would need to be easily identifiable, possibly categorised and summarised according to the type of mitigation

recommended, and the phase of the project (Ridgway, 1999; Sánchez and Hacking, 2002). The mitigation summary would be more in line with the schedule of mitigation commitments discussed previously, but, with the integration within a systematic EMS approach, arguably there would be a higher probability of effective implementation.

A key element in the process would be the evaluation of the implementation of the measures. Effective implementation may come at a very high price, in terms of the demands on resources and the organisation. This will be especially true for monitoring impacts and relating these to specific measures, resulting from a specific project (Arts and Nootboom, 1999). Implementing an EMS (a voluntary, essentially self-regulating activity) can be a time-consuming and expensive operation (Rondinelli and Vastag, 2000).

The fact that further advances are required if the record of implementation of mitigation measures is to be improved was identified by the Environment Agency who suggest appropriate mitigation measures in their *Handbook for Scoping Projects* for a range of development types (Environment Agency, 2002). There is also a recognised need to improve the quality of ESs, since poor statement quality may be an important reason for the lack of reliance on the ES in formulating conditions and obligations (DETR, 1997).

In addition, if EMPs, schedules of commitment, or EMS implementation are not used, the descriptions of mitigation in the ES itself must be detailed and precise enough to enable them to be translated easily into planning conditions (Carroll and Turpin, 2002). Arguably, more guidance on the use of criteria in drafting effective mitigation measures would aid this process. Marshall (2001) has proposed criteria and frameworks that could be incorporated into such a guidance document.

This exploration of alternative approaches to effective implementation of mitigation measures illustrates some of the problems in the current EIA processes in England. Apart from issues arising from the lack of familiarity of decision makers with ES preparation and examination (Gwilliam, 2002; Weston, 2002), many problems could be linked to the lack of attention to EIA follow-up, particularly related to individual projects (Arts and Nootboom, 1999; Arts *et al.*, 2001; Wood, 2003).

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**There is a recognised need to improve the quality of ESs, since poor statement quality may be an important reason for the lack of reliance on the ES in formulating conditions and obligations**

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## Conclusions

This research has focused on the rationalist paradigm in that the role of EIA in decision-making has been taken to be one of providing information to facilitate better decisions. For the consideration of the role of mitigation measures in facilitating conditions and obligations, this enables a straightforward analysis, although it is acknowledged that the influence of mitigation measures on decision making measured using other paradigms is not considered.

This research has demonstrated that approximately a half the mitigation measures in the ESs were found not to be covered by planning conditions or obligations, casting doubt over whether they would be implemented. Significant variations were found in the coverage of mitigation between different environmental aspects, further complicating the issue. The presence of large numbers of extra conditions and obligations not based on the ESs suggested that other factors, such as consultation and expert judgement, were also important in the drafting of planning controls. The proportion of extra conditions and obligations compared to those based on ESs and uncovered mitigation measures was shown to be influenced by environmental aspect.

These conclusions should be interpreted in the light of difficulties experienced in assigning mitigation measures to the various types in the simplified version of Mitchell's (1997) mitigation hierarchy. Mitigation seems to behave as a continuum, rather than a series of discrete types, making it difficult to ascribe some of the measures to one particular type in the hierarchy. This meant that the division was somewhat artificial, but care was taken to ensure consistency in the allocation of different 'types' to the various measures.

These findings suggest that the English EIA and planning systems are not effective in ensuring that mitigation measures proposed in ESs are implemented. This is a great concern for the ability of the EIA process in England to combat environmental impacts, as "mitigation measures are of little or no value unless they are implemented" (Glasson *et al.*, 1999, page 156). Another critical point, however, is that the review of cases covered part of just one English planning region. The results do raise questions about the way in which mitigation measures are translated into planning conditions and obligations, but it is not possible to assume the same conclusions are valid for other English regions, nor for Wales, Northern Ireland and Scotland.

The study has been largely quantitative in nature and, whilst statistically valid evidence has been found for differences in the treatment of mitigation measures for different environmental aspects, and also for dependency between use of mitigation measures and the type they can be categorised into, further research is needed to examine why this is the case and what influences are operating on the key actors. In particular, more research is required into

the reasons for the relatively small numbers of suggested measures (and imposed conditions and obligations) for several environmental components (such as air quality).

A major improvement in the coverage of mitigation measures by planning conditions and obligations is suggested as being necessary to ensure increased implementation across England. However, the study has also found that publications that may have been expected to improve mitigation, in the form of Mitchell's (1997) mitigation hierarchy and the DETR's (1997) report, cannot be isolated as significant influences on the use of planning controls to secure mitigation.

The following recommendations are tentatively made to improve the effectiveness of the EIA and planning systems in ensuring mitigation implementation:

- ensure more comprehensive and consistent guidance targeted at both planners and at consultants/developers, across all environmental components;
- increase the use of EMPs to facilitate the formulation of conditions and obligations;
- provide guidance to planning authorities to ensure that the contents of EMPs are covered by planning controls;
- if imposing mandatory EMPs is seen as impractical, the use of schedules of mitigation commitments or mitigation schemes is recommended instead;
- encourage the wider take up of EMSs as a means of effective management of mitigation implementation and monitoring;
- encourage improvements in ES quality to facilitate the formulation of planning controls, possibly including the use of criteria for drafting mitigation measures; and,
- concentrate more research effort on EIA follow-up, particularly on cost-effective options for significant improvements in practice.

Improvement in the implementation of mitigation measures is vital if EIA is to live up to its potential as an instrument to protect the environment and encourage sustainable development (Wood, 2003). This study has shown that there is much still to be done before the English EIA and planning systems become fully effective in ensuring this most crucial aspect of the EIA process.

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